Estimating Market Supply and Demand for Offsets from a U.S. Perspective: A New Approach

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• U.S. non-profit “501(c)(3)” organization founded 1973

• Scientific research consortium established to perform objective electricity research for the public benefit
  – Generation, including renewables
  – Environment
  – Power Delivery, Markets & Energy Efficiency
  – Nuclear
  – Technology Innovation

• Principal locations — Palo Alto, CA, Charlotte, NC and Knoxville, TN

• Members include Electric companies, federal / state / local government & OEMs, and includes:
  – >90% of electricity generated and delivered in the U.S.
  – More than 450 participants in over 40 countries
Today’s Topics

1. Definition and Importance of Offset from a U.S. Perspective
2. Potential Mitigation Supply
3. A New Approach to Estimating the Market Supply of Offsets

Analysis Team

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Greenhouse Gas Offset Definition

- “Credits” for GHG emission reductions, avoidance or sequestration that occur in sectors or geographic regions outside of an emissions cap
- Offsets = Difference between “business-as-usual” and residual CO₂ emission


GHG emissions reductions must be real, additional, permanent, measurable and verifiable.
GHG Emissions Offsets Can Provide “Cost Containment” & Reduce Future CO\textsubscript{2} Costs

CBO Estimates of the Effects of Waxman-Markey (HR 2454) “With” and “Without” Offsets in 2030

<table>
<thead>
<tr>
<th></th>
<th>With Offsets</th>
<th>Without Offsets</th>
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<tbody>
<tr>
<td>CO\textsubscript{2} allowance price ($/tCO\textsubscript{2}e)</td>
<td>$40</td>
<td>$138</td>
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“The cost savings to the economy generated by offsets could be substantial. CBO estimates that between 2012 and 2050 average annual savings from offsets could be about 70 percent under ACESA.” (CBO Analysis of HR 2454, p. 8)

MERGE Results: Energy-related CO₂ by Region Non-OECD (2030)

Source: G. Blanford, EPRI
MERGE Results: 70% of Energy-related Potential is In the Electric Sector

Source: G. Blanford, EPRI
Non-CO₂ Marginal Abatement Costs

China, the US, the EU, India and Brazil emit the most non-CO₂ GHGs. As the largest emitters, these countries offer important mitigation opportunities.

Source: US EPA, 2006
Problems with Existing Estimates of Offset Supplies

- Omissions – existing analyses assume no transaction costs, investment risks, and limits on availability. Those analyses attempting to refine offset supply estimates, have used arbitrary adjustments and other mechanisms.

- Project experience – experience to date in the CDM suggests that immediate offset supplies (e.g., Coal-mine methane destruction in China) are very limited.

- Simplistic – existing analyses of future offset supplies are based assumption of full and perfect emissions trading. There is insufficient attention to the policy specifics.
Need to Develop a *New Approach* that is Policy Realistic

Greater Risk:
- Counterparty
- Project/Investment
- Government/Regulatory
- Lack of transparency

**China Coal CH$_4$ Mitigation for 2020**

Estimated annual average of all China coal CH$_4$ CDM projects thru 2020 approved or at validation >$10/tCO$_2$ = ~ 34 MtCO$_2$-eq

Source: US EPA, 2006
From Economic to “Policy” Mitigation Estimates

Different outcomes depending on policy mechanisms

- **CDM / Project-based Potential**
- **Sector Crediting Potential**
- **Allowance Trading Potential**

$\$/tCO_2

Full Economic Potential

Examples:
- Renewables
- Adv Fossil
- Coal CH₄ mitigation
- Afforestation

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Project Based Delivery rates

- Natsource financial project delivery likelihood assessment
  - based on extensive project evaluation and project investment experience
- Projects evaluated in terms of five risk factors
  - Country
    - Country Investment Risk (CI)
    - Country Carbon Regulatory Risk (CCR)
    - Proponent Risk (PR)
  - Project
    - Project Country Performance Risk (PCP)
    - Project Technology Performance Risk (PTP)
- Representative factors generated for 201 countries (158 non-Annex 1) and 65 project types

Preliminary. Do not quote or cite.
From Natsource data we constructed Monte Carlo simulations and derived expected delivery rates – assumed technology and country factors are independent (but factors in each group not).
Example of Sector-based Crediting

India Electric Sector Projections

- CO2 Emissions BAU
- CO2 Emissions Baseline
- CO2 Emissions Credit
- Electricity Generation

CO2 Emissions (Mt)

Electricity Gen (TWh)

NAMAs Credit
Offset Credit

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Example: China – Coal Mine Methane

China - Coal
2020 Baseline Emissions - 190 MtCO2e
NAMA Adjustment = 86 MtCO2e

Price ($/tCO2e)

Cumulative Reductions (MtCO2e)

Unadjusted economic potential
Delivery adjusted/project potential
NAMA adjusted/sector potential

Preliminary. Do not quote or cite.
Example: China – Landfill Methane

China - Landfills
2020 Baseline Emissions - 50 MtCO2e
NAMA Adjustment = 22 MtCO2e

Preliminary.
Do not quote or cite.
Example: Mexico – Landfill Methane

Mexico - Landfills
2020 Baseline Emissions - 39 MtCO2e
NAMA Adjustment = 12 MtCO2e

Breakeven Price ($/tCO2e)

Cumulative Reductions (MtCO2e)

Unadjusted economic potential
NAMA adjusted/sector potential
Delivery adjusted/project potential

Preliminary. Do not quote or cite.
Next Steps & Conclusions

• Apply adjustments to more sectors, especially energy and land-use mitigation.

• Offsets Analyses (estimates of non-allowance GHG mitigation potential) need to be updated and more policy realistic. Current analyses are too optimistic.

• Policy Challenge is to balance between:

  Lower domestic carbon price

  Developing country participation (NAMAs)